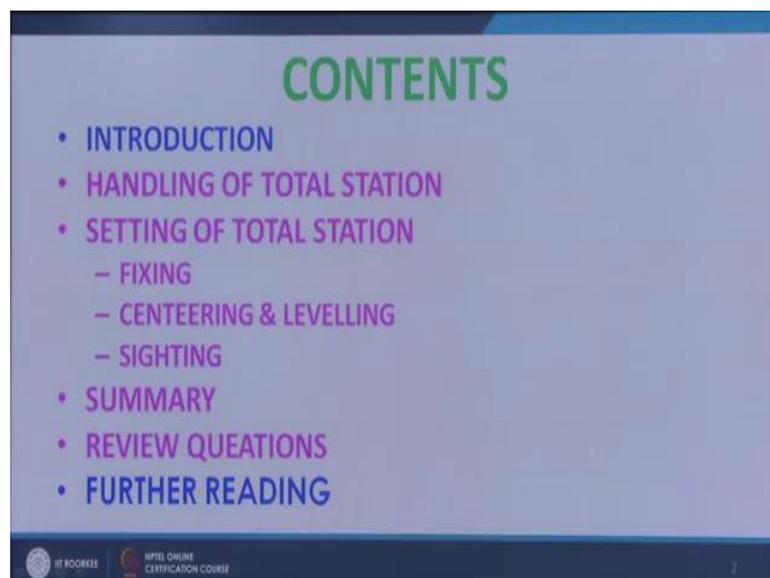


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Lecture - 20
Total Station Handling & Setting

Welcome students, this is lesson number 20. In this lesson I will talk about how to handle the total station for its safety and to make use of securely and then I will like to discuss about the temporary adjustment of a total station it is the prerequisite for all total station field work. So, this lesson will be discussed under these following heads after introducing handling of the total stations.

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- HANDLING OF TOTAL STATION
- SETTING OF TOTAL STATION
 - FIXING
 - CENTEERING & LEVELLING
 - SIGHTING
- SUMMARY
- REVIEW QUESTIONS
- FURTHER READING

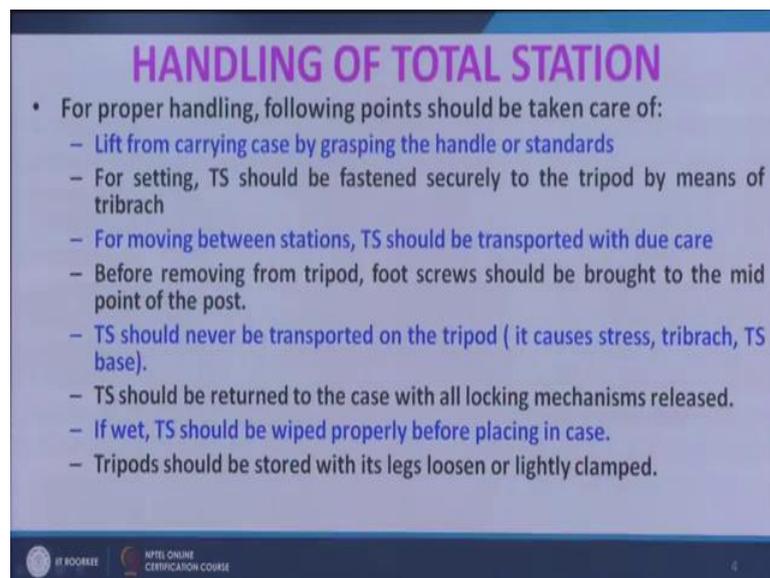
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Now, I will explain the some criteria or the points which you should follow while using the total station followed by how to set up the total station that is also called the temporary adjustment of total station that includes three operations fixing centering and leveling and sighting followed by summary and review questions.

Now, for proper and efficient work actually total station should be handled with a lot of gap because total station is an electronic instrument. So, it should be it is very sensitive. So, we should be very much careful in handling it in during use during transportation and followed by whenever we will use the total station first we should satisfy some primary criteria regarding its different excess. So, that those criteria we can satisfy throughout

temporary adjustment which is also called the setting operation; however, one thing we should ensure that before we make use of a total station all the permanent adjustment of a total station should be correct. So, that is the prerequisite condition for making use of any total station.

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HANDLING OF TOTAL STATION

- For proper handling, following points should be taken care of:
 - Lift from carrying case by grasping the handle or standards
 - For setting, TS should be fastened securely to the tripod by means of tribrach
 - For moving between stations, TS should be transported with due care
 - Before removing from tripod, foot screws should be brought to the mid point of the post.
 - TS should never be transported on the tripod (it causes stress, tribrach, TS base).
 - TS should be returned to the case with all locking mechanisms released.
 - If wet, TS should be wiped properly before placing in case.
 - Tripods should be stored with its legs loosen or lightly clamped.

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So, now let me start with the handling of total station. So, this is a total station a a total station kept in this a case whenever we will use this total station first we have to take it out now whenever we will take it out we should hold the handle of the instrument and then only we should take it out. So, we should be very much careful in it how to take out the instrument from a case, now after we have taking it out we will be need to (Refer Time: 02:57) the instrument with the tripod stand now whenever we will use the tripod stand first.

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So, before we work we have to fix this instrument on the tripod stand. So, while fixing we have to take care that this is screw (Refer Time: 03:20) screw should be done very firmly. So, we have to be ensure that yes (Refer Time: 03:23) has been done securely. So, this is what we should do during our work done (Refer Time: 03:31) we will be test transferring this station to some other station we should never carry this together we should first unfix the instrument using this unfixing screw then we have to take it then we have to hold this instrument with the handle and then you have to carry it like this. So, carrying it a transportation of this instrument with holding on the handle is very important while you will be transferring this instrument again to the case first we should see whether this foot is screws are in the middle or not.

So, we should see that this is in between these and in some instrument there are some marking. So, those would be easy for you to justify otherwise. So, our estimation you have to make it in between and then only and also this is screws like this vertical blade many screw then horizontal blade main screw this screw should be open it should not be fixed then only you should hold on the handle and then you should keep it inside the case. So, these are the important points which you should always follow before you use or during your use and then use during experiment if some rain or some water gave due to due to some rain or water it gets wet you should nicely right the instrument and then only you should put inside the case and when the tripods will be once your work is over then tripod stand you should then in that case this is put a screw should not be. So, hardly

pressed and it should be slightly. So, that it does not come out it should not be tightly pressed. So, these are the care you should take while using the total station.

So, these are the very simple precautions which we should follow during use of total station and that will make keep our instrument in good condition. Now next point is that setting of total station; that means, we know that the total station has three fundamental axis one is vertical axis one is horizontal axis and the third one is our axis line of sight or axis of the axis or line of sight.

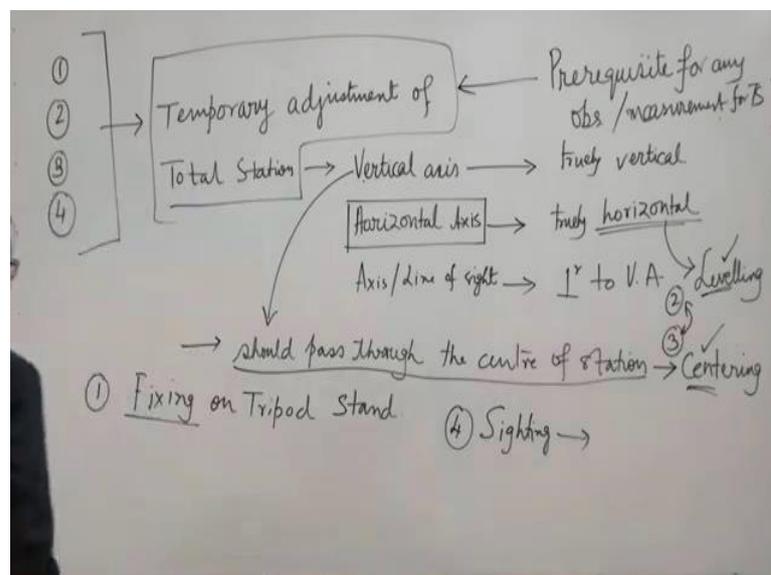
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SETTING OF TOTAL STATION

- Temporary adjustment of a TS consists of
 - Fixing : to place TS over the station in approximate leveling and centering.
 - Centering : To make vertical axis of TS pass through the station mark.
 - Leveling : to make the horizontal axis of the instrument truly horizontal
 - Sighting : to make image of the object appear at reticle.
- FIXING
 - The fixing operation consists of fastening of TS with the tripod stand along with approximate leveling and centering over the station. For fixing the instrument, the tripod is placed over the station with its legs widely spread so that the center of the tripod head lies above the station point and its head approximately level (by eye estimation). The instrument is then fastened with the tripod by screwing through base plate. The height of the instrument should be maintained in such a way that observer can see through telescope conveniently. Approximate leveling will make the circular level bubble near its center. Approximate centering need to be ensured through plummet. If required, the approximate leveling and centering of the instrument over the station is done by moving the tripod legs radially or circumferentially as per need of the circumstances.
 - Radial movement of the legs makes the vertical axis gets shifted in the direction of the movement of the leg without seriously affecting the level of the instrument.
 - Circumferential movement of the legs adjusts level of TS without affecting much the vertical axis.
 - Sometimes, the instrument and the tripod have to be moved together bodily for centering.

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Now, before taking observation using total station we must have vertical axis truly vertical and horizontal axis truly horizontal and line of sight should be perpendicular to vertical axis now and the vertical axis should pass through should pass through the center of station. So, these are the conditions we should follow to work with total station.

Now, to make the horizontal axis truly horizontal this is this can be done by an operation called leveling and the vertical axis of the total station should be should pass through the center of the station that is called by centering. So, before we take observation using total station we need to level the instrument we need to center the instrument where to make our observation easy we should place the instrument at certain height and. So, we inhabit to fix the instrument on tripod stand; tripod stand.

So, this is the first thing we need to do after that we need to do the leveling and centering or centering or leveling that has to be done simultaneously and followed by whatever we will see or whatever the observed we will see that is called sighting. So, sighting, these are the 4 operations which are you need to do before taking any measurement and these formal operations like fixing them leveling and centering and then sighting these 4 operations together are call temporary adjustment or total station total station and this is prerequisite for any prerequisite for any measurement or observation station and this is this is prerequisite for any pre requisite have any measurement or observation using for total station.

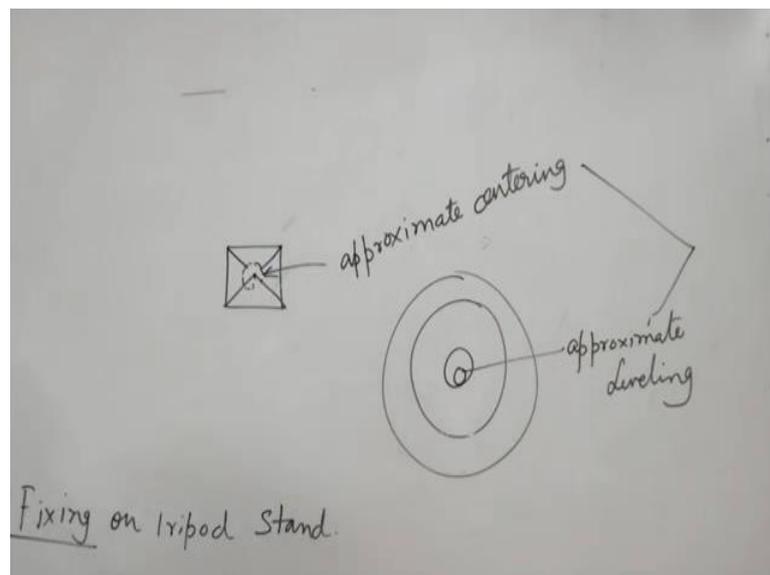
So, now, I am that is what I will be (Refer Time: 10:30) discussing. Now fixing on tripod stand by all means to (Refer Time: 10:37) the instrument to the tripod stand and not only that this will also during (Refer Time: 10:44) also we will carry out some approximate centering and leveling then we will do the centering. Means we will make some operation which will make these instrument exactly on the station that is called centering and then we will go for leveling of the instrument; that means, we will make the place horizontal and finally, we will go for the sighting of the object; that means, to make the object innate of the object fall on the plane of the vertical and we can see the vertical clearly and that is called sighting. So, that is what we have to do and then only we can go for any measurement using our data collector.

Now for a fixing as I told you fixing means (Refer Time: 11:51) the tripod total station on the tripod stand. So, I will like to show you how it is to be done this is the tripod stand

first you have to open the screws and then you make the stand it as (Refer Time: 12:16) convenient to you then we spread the legs of this in such a way that it is well separated and also we will like to set up and just on the top of the station. We will see that the where is this element through this we will look and we will try to find out the center of this hole is just on the top of the station.

So, this is the first thing we will do that is the approximate centering and also we will make this head of the tripod stand level and that we have to do their eye estimation. So, once it is done that is called approximate leveling and centering. Now sometimes this not may not be possible then we have to make use of this tripod legs sometimes taking it out all circumferentially to make this point the center of this should be just above the station. So, that has to be done. So, once it is done, now I can see that our instrument is approximately above the center of the station and also head of this approximately level, now I will take out the instrument to (Refer Time: 13:50) on it. So, as I told you instrument has to be taken out handle and then you check first you should check whether this foot screws are in the middle or not if it is not then you have to make it in the middle. So, in the middle, (Refer Time: 14:11) is it now we have placing it on the toper head and then we have to (Refer Time: 14:18) it using this fixing screw.

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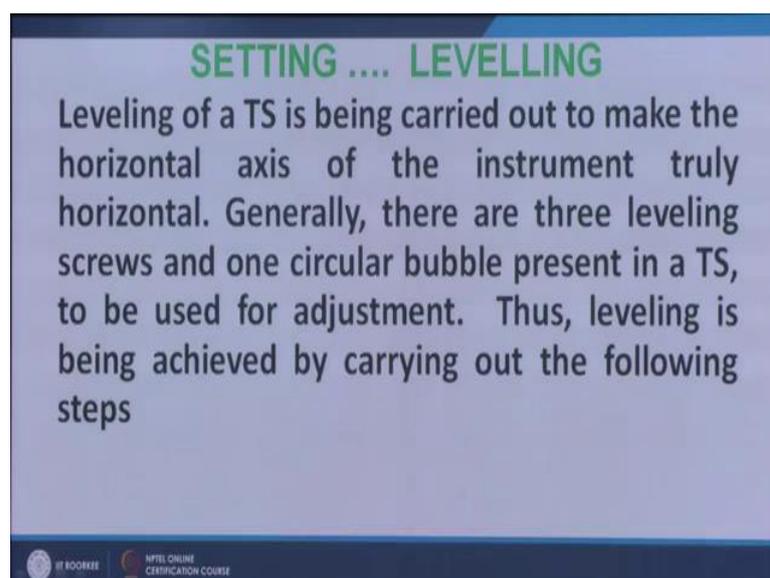
Now, we have to check the in this there is a circular bubble as I told you now we have to check the circular bubble whether there is a circular bubble like this circular level in the

which there is a circular bubble. So, we should try to take keep it as best as possible within this. Now you we can see that the bubble is not in the middle hit the bubble is not in the middle then we have to make use of this legs and to bring this bubble in the middle. So, now, you can see that we have done it and now the bubble is that it is exactly in the middle. So, now, I can see now you have to see again through this optical planet to find out whether the instrument is exactly (Refer Time: 15:23) within the center of this or not.

Now, if it is fine otherwise you have to look through this and you have to adjust the legs to bring this instrument a more or less in the middle not. Now let us say the instrument location is some are here our planet the point somehow like this; that means, in a small circle the your X ray should be passing through now this is called approximate centering and whenever we will make all these bubble in the circular level somewhere like this or maybe like this maybe like this or it may be like this whatever it is. So, like this. So, this is called approximate leveling. Now these approximate centering and leveling this part has to be done by making use of the tripod stands with this is screws and all these thing.

So, once we have brought these level a bubble in the; at the center or near center of this circular level and our vertical axis is somewhere around this. So, approximal now I can say that the fixing operation is over next I will like to go for leveling.

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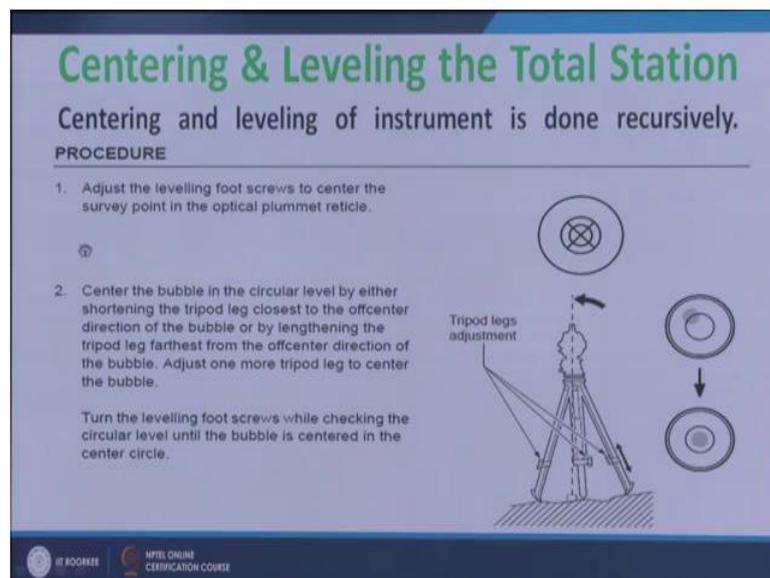
SETTING LEVELLING

Leveling of a TS is being carried out to make the horizontal axis of the instrument truly horizontal. Generally, there are three leveling screws and one circular bubble present in a TS, to be used for adjustment. Thus, leveling is being achieved by carrying out the following steps

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Now, leveling of the total station is being carried out to make the horizontal axis of the instrument truly horizontal. Now this is done by making use of the foot screws and the circular bubble and also there is some electronic arrangement compensated. So, making use of this we can carry out the leveling operation nicely.

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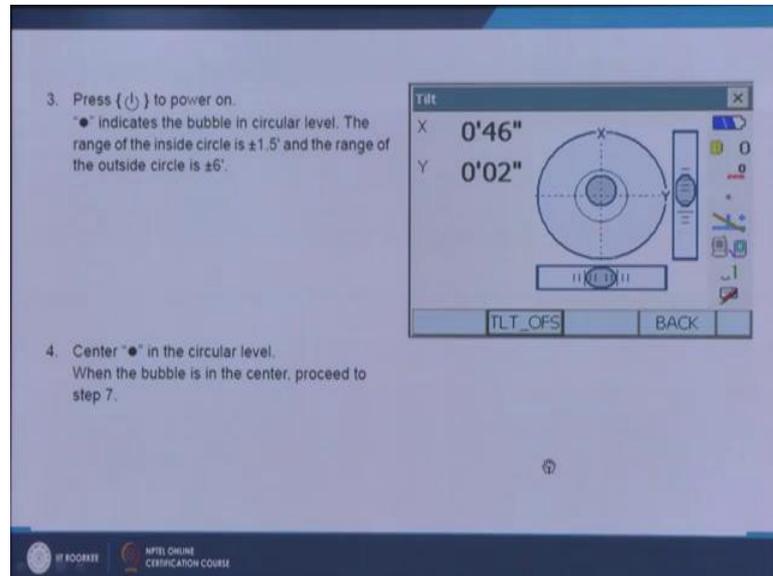


Now, this is actually generally in case of total station centering and leveling has to be done simultaneously because if we do the leveling then centering maybe out again only centering if we do then leveling will be disturbed. So, leveling and centering has to be done simultaneously and of course, leveling work should be finished first and then finally, centering needs to be done because we can open this screw and we can shift our instrument a bit. So, finally, we can do this centering operation now to carry out the leveling as I as we have done that the we can make this circular bubble circular bubble a circular level with the bubble at the center and then we can also if our bubble if we fail to bring the bubble at the center like this sometimes it may be difficult.

So, somewhere like this you after long number of try you may fail to bring the bubble like this. So, in that case we have to bring the bubble within the center by using the foot screws. So, foot screws may be used to bring the bubble at the center if someone fails to do it using the tripod stand. So, that is what it is written here.

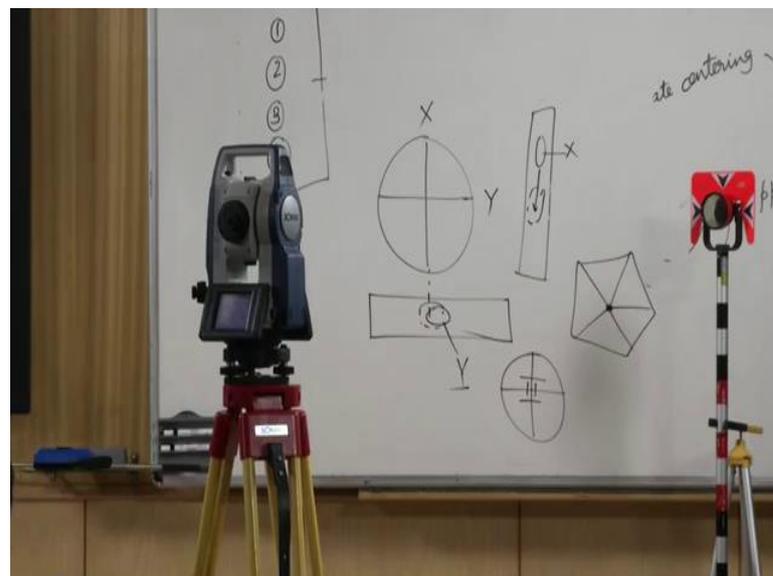
Now, once this bubble is are in the center; that means the approximate leveling has been done. Now we can make it on to make use of compensator or you will see this is the same thing available here similar to the figure given shown here.

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And in this you can see that there are two axis this is called X axis and this is called Y axis in this instrument and corresponding to both axis there will be one cross bubble shown in a window like this is the Y bubble here something like this and there is a bubble like this is the X bubble X bubble this is the Y bubble.

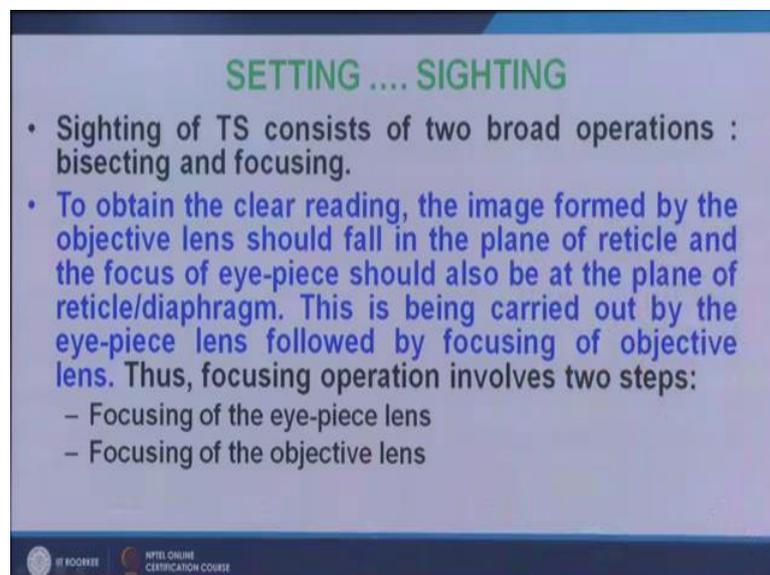
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Now, we have to take the instrument parallel to any two of the foot screws and then we can take the foot screws either inside or outside to now when it is like this. So, I can say that the Y bubble we are adjusting. So, when the value is changing. So, now, this is the X bubble we have to changing the X bubble or by adjusting the foot screws we have to bring these to this place and this one more or less this place. So, so you can see that is there is a circular bubble which should be in the middle and these both this congenial bubble the bubble should be in the middle. So, that will be the ideal condition for leveling. So, that is we are we are trying to do.

So, now because we are moving a; this is there is a disturbance. So, leveling has been disturbed the instrument is. So, sensitive, but ultimately now it is in the middle you can say. So, we can say that the instrument is properly leveled or you should see through this optical planet whether this instrument is also exactly centered or not if it is fine otherwise if it is not then we can open it and we can shift this instrument a bit. Now the instrument is exactly centered over the station as well as it is leveled. So, now we done instrument is titan. So, leveling and centering has been done.

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SETTING SIGHTING

- Sighting of TS consists of two broad operations : bisecting and focusing.
- To obtain the clear reading, the image formed by the objective lens should fall in the plane of reticle and the focus of eye-piece should also be at the plane of reticle/diaphragm. This is being carried out by the eye-piece lens followed by focusing of objective lens. Thus, focusing operation involves two steps:
 - Focusing of the eye-piece lens
 - Focusing of the objective lens

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Next sighting now suppose with this instrument I like to observe the reflector here suppose this is the point suppose this is the point I like to observe suppose this is the point whose observation we like to take. So, just on the on the point we will keep the reflector and now if I want to make use of can take the reading first I will first I will like

to orient through these collimator I will like to rotate the total station about the vertical axis and find out whether this is in that line or not.

So, if it is, so then I will fix the horizontal circle main screw then I will first look through I bees and adjust this is screw to see the cause errors in the vertical then I will like to see through this and I will find out whether the and this focusing screw of the objective lens I will rotate it see the now I can see that how I am unable to see it. So, I have to rotate these by opening the main horizontal main screw yes, now I can see. So, I can fix the horizontal main screw and I have to see this. Now I have rotated this telescope about its horizontal axis to see these whether this reflector is seen or not now I can see now I will fix the vertical main screw.

Now, I will like to make the fine adjustment using the horizontal and vertical tangent screw. So, actually yeah in this prison there will be like this a lot of and I have a reticule like this. So, this point I am trying to coincide with this by using the fine adjustment a particle fine screw of the vertical as well as horizontal main screw. So, now, it is fine. So, exactly and I can see that point and very sharp image. So, that is what is called sighting. So, first I had oriented I have moved this total station about the horizontal vertical axis by opening the horizontal scale main screw then once I find that then using the vertical plate main screw I have oriented that thing.

So, now, I can see the reticule is like this. So, so once it is done; that means, my temporary adjustment is over let me now already I had done the focusing of eye piece screw eye piece lens to see the reticules and; that means, this is the reticule clearly I have focused the objective lens. So, that I can make this a prism occasion and this reticule in center, after this now I can start taking observation by pressing the necessary buttons. So, that is all about the setting or temporary adjustment of the total station and in the next class we will in some other class we I will like to take up how to really take the measurement.

So, with this I like to conclude today's class. So, the summary is that for effective use of the total station we should must handle our instrument with due care and it should be minimal secured securely kept since total station is an electronic instrument it is very sensitive. So, we should be very much careful in handling it for taking any measurement of any field work or making any field work using total station always we need to do the

temporary adjustment of the instrument temporary adjustment of total station consisting of fixing leveling and centering and followed by sighting.

However, one condition has to be always followed that total station should always be permanently adjustment condition their permanent adjustment conditions of the total station should be always there then only we can start work with the total station. So, and the in temporary adjustment actually fixing is done first where approximate centering and leveling is to be done followed by final centering and leveling and finally, we have to carry out the sighting operation to before taking the measurement.

With this I like to conclude today's class and next class I will talk on how to do the measurement of distance using total station.

Thank you.